

## Public Review Comment Metric

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| <b>Originating Office:</b><br>AIR-130 | <b>Document Description:</b> TSO-C159c<br>Next Generation Satellite Systems (NGSS)<br>Equipment | <b>Project Lead/Reviewer</b><br><b>David W. Robinson</b> | <b>Reviewing Office:</b> | <b>Date of Review:</b> |
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|    | <b>Commenter</b> | <b>Section #<br/>and<br/>Page #</b> | <b>Comment</b>   | <b>Suggested Change<br/>and<br/>Rationale</b>   | <b>Disposition</b>   |
|----|------------------|-------------------------------------|--|---|--|
| 1. | Garmin           | Page 2-3, Paragraph 3.a             | <p>Table 1B and Table 2B Requirements column refer to Appendix E Sections 2.2.1.1.X that do not exist in DO-262B as numbered sections.</p> <p>It appears that the intention of DO-262B Appendix E was to include sections 2.2.1.1.1 to 2.2.1.1.11 as it refers to these sections in paragraph 2.2.1.1.</p> <p>If Table 2B keeps the references to 2.2.1.1.X, then all of the “X” values should be reduced by 1 to keep the subparagraph numbered logically. The range would be 2.2.1.1.4 to 2.2.1.1.11 instead of the shown 2.2.1.1.5 to 2.2.1.1.12.</p> | Update all references to Appendix E, Section 2.2.1.1.   | Concur. DO-262B Appendix E appears to have an editorial error in which the referenced subparagraphs are missing their numerical designators. The Appendix E references in the TSO were revised to indicate the applicable subparagraph titles within DO-262B Appendix E section 2.2.1.1. |
| 2. | Garmin           | 3.c.(1-3)<br>Page 4                 | <p>Paragraph. 3.c.(3) includes the statement:</p> <p>Develop the system to, at least, the design assurance level equal to this failure condition classification.</p>   | Suggest changing to the alternate wording identified in paragraph 3.c. of the TSO Template in Order 8150.1C Appendix G. | Nonconcur for the following reasons:<br>1) Failure condition classifications identified in paragraph 3.c refer to the effect of the loss   |

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|  |                  |                                     | <p>Wording needs to change to allow failure condition to be determined at the aircraft level.</p> <p>This statement implies the failure condition classification of an appliance is determined by the TSO regardless of mitigations employed to meet aircraft level safety requirements such as redundant appliances/systems. Unless the DAL cannot be affected by the installation, the aircraft System Safety Assessment should determine the failure classification and by extension, the design assurance level (DAL) requirement. The aircraft FHA/SSA ultimately determines the DAL requirement for a particular installation. Specifying the DAL at the appliance level without the benefit of the specific aircraft level FHA/SSA means that in some cases the DAL will undoubtedly be higher and more costly than necessary. This will have a chilling effect on the installation of new, safety enhancing technologies since the cost will be greater than necessary. It is</p> |   | <p>or failure of function on the aircraft (i.e., at the <i>aircraft</i> level) consistent with the definition of “failure condition” and associated failure condition classification definitions provided in AC XX.1309.</p> <p>2) Per the functionality definition in paragraph 3.b, the failure condition classifications identified in paragraph 3.c are based on the two safety related functions (ATS and AOC). That being said, note that the effect of loss or failure of function is only identified as minor. The FAA</p> |

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|    |                  |                                     | <p>possible to build and certify a TSOA appliance that cannot be approved for installation in one or more aircraft types because it does not have the required DAL. Similarly, just because the appliance meets a TSO DAL does not mean it can be approved for installation. We recommend that no failure classification/DAL requirement be included in a TSO when the installation can affect or mitigate the hazard level and therefore consideration should be given to revising paragraph 3.c in this TSO to the general guidance in the Recommendation column.</p> <p>Additionally 2 of the 4 communication categories supported by this TSO are listed as non-safety of flight functions in 3.b. For systems that only support these 2 communication categories the DALs listed in the TSO are inconsistent.</p> |  | would not consider equipment designed only to support the other two functions (AAC and APC) as significantly safety-enhancing. |
| 3. | Garmin           | 3.g<br>Page 5                       | Including this specific DO-254 reference is redundant to the rest of the paragraph in this section.  | Remove this reference to DO-254 Paragraph 1.6. | Comment no longer applicable. We have rewritten paragraph 3.c to state that loss or failure of                                 |

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|    |                  |                                     | <p>For custom airborne electronic hardware determined to be simple, RTCA/DO-254, paragraph 1.6 applies.</p> <p>DO-254 makes it clear how to address “simple” custom airborne electronic hardware.</p>  |   | <p>function is a minor failure condition, based on NGSS being supplemental to HF communications.</p> <p>Accordingly, per policy, paragraph 3.g is no longer required and we have deleted it from this revision of the TSO.</p>  |
| 4. | Garmin           | 4.b<br>Page 5                       | <p>TSO paragraph 4.b includes the statement:</p> <p>Also, mark the following permanently and legibly, with at least the manufacturer’s name, subassembly part number, the TSO number, class and subclass identification:</p> <p>The Order 8150.1C TSO template does not include the “equipment class and subclass” phrase.</p> | <p>Remove “class and subclass identification” from paragraph 4.b.</p> <p>Garmin is routinely granted deviations from TSO requirements to mark the “applicable equipment class(es)” as the equipment does not have sufficient space to include this as well as all other required markings (e.g., multiple TSOs and SW level, etc. that appear in other TSOs). This deviation is granted through</p> | <p>Nonconcur. This TSO equipment marking is not a template requirement but made at the request of manufacturers to increase flexibility of component TSO product development. The discussion of marking size/space was not an issue and was desirable to those equipment manufactures involved.</p> |

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|    |                  |                                     |  | use of a marking similar to the example in Order 8150.1C ¶ 7-4.e.(4).(b) “See Inst Mnl for Addtl TSO approvals and/or markings.”.   |   |
| 5. | Garmin           | 4.b.(2)<br>Page 5                   | Paragraph 4.b.(2) states:<br><br>Each subassembly of the article that you determined may be interchangeable.<br><br>This language is confusing.  | The language for this requirement is confusing. This could mean that a stuffed printed circuit board needs the TSO number.<br><br>Suggest removing the statement or if removing causes problems, work with industry to establish wording that is better understood.                       | Nonconcur. This wording is consistent with TSO template. This statement refers to Table 3, Valid Combinations of System Components, where some components are interchangeable with each other within the same Class.  |
| 6. | Garmin           | 5.e<br>Page 8                       | TSO paragraph 5.e and its subparagraphs include definition of non-TSO functions and the data to be submitted to the ACO for non-TSO functions. This guidance is inconsistent with Order 8110.4C CHG 4. | TSO paragraph 5.e states “Identify functionality or performance contained in the article not evaluated under paragraph 3 of this TSO (that is, non-TSO functions).”<br>Use of the term “performance” in the definition of a non-TSO function is inconsistent with the Order 8110.4C CHG 4 | Nonconcur. Order 8110.4C (Chg 5 incorporated) para 6-9.b.(1) defines a non-TSO function as “one that is not covered by a TSO-approved minimum performance standard (MPS), does not support or affect the hosting article’s TSO function(s), and could technically be implemented outside of the |

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|  |                  |                                     |                | paragraph 6-9.b.(1) and 6-9.b.(3)(a) guidance regarding how to define a non-TSO function. The issue is non-TSO should not be defined as “performance”. It will create difficulty if these criteria are used. For example, if a TSO requires a minimum 10 watt transmitter and a company makes equipment that is robust at 11 watts, the performance exceeding the TSO is not called out under the TSO; consequently, by the paragraph 5.f “performance” definition, the 11 watt transmitter has a non-TSO 1 watt capability. The distinction of a “function that can be accomplished outside the TSO box” as is specified in Order 8110.4C CHG 4 paragraph 6-9 is critical to making non-TSO function work long term. | TSO article.” Furthermore, Para 6.9.b.(3)(b) of the order requires manufacturers to submit the manufacturer’s declared performance requirements for the non-TSO function(s). It is these aspects of “functionality or performance” that the TSO template language refers to here. In the example the commenter gives, as the commenter identifies, an 11-watt transmitter that must output a minimum of 10 watts does not have 1 watt of “non-TSO function”, since transmitter power is covered by the MPS and since that extra watt cannot be implemented outside the TSO article. Rather, it simply meets the TSO minimum performance standard, with a 1-watt margin above the minimum. As such, we do not view the |

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|    |                  |                                     |   | Adjust the wording in the TSO (and template) to be consistent with the 8110.4C CHG 4 intent.  | referenced template language as inconsistent with Order 8110.4C requirements. No change necessary.  |
| 7. | Garmin           | 7.b.<br>Page 10                     | TSO paragraph 7.b contains wording that is inconsistent with Order 8110.4C CHG 4. | TSO paragraph 7.b includes additional guidance about what furnished data should be provided to an operator or repair station when the equipment includes a non-TSO function. The problematic guidance states “include one copy of the data in paragraphs 5.e.(1) through 5.e.(4).” This guidance is inconsistent with Order 8110.4C CHG 4. Order 8110.4C CHG 4 paragraph 6-9.b.(6) defines the FAA-industry agreed data that must be provided to an installer when equipment includes a non-TSO function. | Nonconcur. We have examined the referenced TSO template language against the requirements of Order 8110.4C (Chg 5 incorporated), para 6.9.(b)(6), and although the template language is not a word-for-word match to the order, we find it consistent with the data requirements specified in that paragraph of the order. Refer to paragraph 6.9.(b)(6)(a),(b),(c) of the order for comparison. Any further concerns with non-TSO function data should be discussed with the ACO at project initiation. No |

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|    |                  |                                     |   |   | change necessary.   |
| 8. | AIRBUS           | Section 3<br>Note<br>Page 1         | <p>The Note is misleading and even not relevant :</p> <ol style="list-style-type: none"> <li>1) Indeed, the section 3 clearly states that RTCA/DO-326 or RTCA/DO-326A (Airworthiness Security Process Specification) are not applicable, that means that no security risk assessment is required to the TSO applicant.</li> <li>2) The Note states that a security risk assessment may be required at the time of installation, ie. to be carried out by the TC holder or a STC applicant when the TC holder or a STC applicant installs the equipment. Because it is part of a certification activity (TC, change to TC, STC...), such considerations given in the note are out of the TSO scope</li> <li>3) The FAA AIR policy statement PS-AIR-21.16-02, Establishment of Special Conditions for Cyber Security does not consider the NGNSS</li> </ol> |   | Concur. We have deleted this Note from the TSO and, as necessary, will incorporate applicable guidance on cybersecurity considerations for NGSS installations into a future revision of the associated AC 20-150. |

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|    |           |                            | equipment as being connected to non-trusted services (or non-governmental services). Therefore, this policy statement should not be applicable to the NGNSS equipment   |                                      |  |
| 9. | AIRBUS    | Section 3c<br>Page 4       | <p><i>We determined the failure condition specified in paragraphs 3.c.(1) and 3.c.(2) of this TSO based on the assumption that the NGSS equipment is intended for applications that typically supplement HF voice communications in procedural airspace area operations</i></p> <p>➔Does that mean that FAA understanding is that for A/C without HF and with SATCOM, SATCOM FC is still minor?</p> |                                      | A: Not necessarily. The failure condition classification is based on the hazard class of the function considering the operating environment, Required Communication Performance (RCP) and operating procedures. The failure condition specified in paragraphs 3.c.(1) and 3.c.(2) of this TSO is based on NGSS equipment supplementing primary HF voice communications in procedural airspace area operations. We have rewritten paragraph 3.c to state that loss or failure of function is a minor failure condition, based on NGSS |

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|     |                  |                                     |  |   | being supplemental to HF communications. Use of NGSS equipment for primary voice or data communications may include a need to develop the NGSS equipment to a higher design assurance level than specified in paragraphs <b>3.c.(1)</b> through <b>3.c.(3)</b> and drive a revision to this TSO.   |
| 10. | AIRBUS           | Section 3c<br>Page 4                | <p><i>Use of NGSS equipment for other purposes (for example, where the equipment is required to apply the separation minimum in procedurally controlled airspace, or for some applications in high-density terminal or en route domestic airspace) may impact equipment performance and safety considerations, which may include a need to develop the NGSS equipment to a higher design assurance level than specified in paragraphs <b>3.c.(1)</b> through <b>3.c.(3)</b>.</i></p> <p>➔It is premature to provision higher DAL at this stage. Safety assessment is</p> |   | Partially concur. The failure condition classification is based on the hazard class of the function considering the operating environment, Required Communication Performance (RCP) and operating procedures. The failure condition specified in paragraphs 3.c.(1) and 3.c.(2) of this TSO is based on NGSS equipment supplementing primary HF voice communications in procedural airspace area |

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|  |                  |                                     | on-going to determine the required DAL for ATN/IPS, but there is no conclusion yet. |   | operations. We have rewritten paragraph 3.c to state that loss or failure of function is a minor failure condition, based on NGSS being supplemental to HF communications. Use of NGSS equipment for primary voice or data communications may include a need to develop the NGSS equipment to a higher design assurance level than specified in paragraphs <b>3.c.(1)</b> through <b>3.c.(3)</b> and drive a revision to this TSO. With regard to the above, however, it should be noted that the original intent of this section was not necessarily to provide specifically for ATN/IPS (although ATN/IPS may also eventually be found to require a higher DAL, as the commenter notes.) |

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